Texas Technology Showcase

Troy Bearden
Energy System's Process Leader
The Dow Chemical Company
tbearden@dow.com

Texas Industries of the Future

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Agenda

- Why Economic Optimizers
- Opportunities
- Justification
- Developing Specifications
- Implementation
- Key Learnings
- Future Direction

Why Economic Optimizers

- Optimizers can display understandable results from large quantities of data
  - Changing efficiencies or demands
  - Variations in stream composition or prices
- Optimizers continually monitor economic cost
  - It is not always the most efficient operating point that yields the most revenues
- Efficiency
  - Efficient operations is no longer a competitive advantage, it is a requirement to stay in business

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Opportunities

Economic Optimizers are not needed for every operation – they are best suited when there are:

- Choices between multiple equipment that delivers similar products
  - Changing efficiencies
  - Changing demands
- Changing values for inputs and outputs
  - Variations in fuel composition and prices
  - Variations in electricity, fuel and steam prices
- Tight operating constraints
  - Equipment limitations
  - Environmental constraints

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Justification

- ***It is very difficult to justify your first Economic Optimizer***
- ***Typical questions when trying to justify Economic Optimizers.***
  - **How do you know how much will we save?**
  - **Are my savings sustainable?**
  - **How can we prove the savings before implementation?**
  - **How much will the Economic Optimizers cost (installation and maintenance)?**
  - **What is the right technology for our company?**
  - **How complicated does the Economic Optimizer need to be?**
  - **Where do we start?**

Justification

- ***Defining the savings***
  - **Savings before implementation are hard to quantify**
    - **Past Economic Optimizer savings**
    - **Studies**
    - **Estimated efficiency gains**
      - ***Percent of fuel savings***

Developing Specifications

- ***Study the opportunity***
  - ***Engage key stakeholders in developing the specification***
  - ***Determine the drivers for economic gain***
    - ***Equipment efficiencies (degradation or loading)***
    - ***Fuel or product price changes***
    - ***Equipment selection***
  - ***Determine how many variables can be manipulated for economic gain***
  - ***Define your economic objective***

Developing Specifications

- ***Determine level of complexity***
  - ***Varies based on the problem***
    - ***Spreadsheets can be used if economic drivers don't frequently change***
      - ***Stable or predictable inputs***
      - ***Contract pricing***
    - ***Simple problems can utilize linear programs in PI system***
      - ***Few economic drivers***
      - ***Few manipulated variables***
      - ***Linear program gets you 80% of the value***
    - ***The greater the manipulated variables, interaction between variables, or inputs the more complex the Economic Optimizer will need to be***
    - ***Integration with control system will also increase the complexity***
      - ***Open-loop versus closed-loop***

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Developing Specifications

- ***Determine level of complexity (cont)***
  - ***Varies based on detail of output***
    - ***Detailed control variable setpoints versus overall equipment load***
    - ***Efficiency details versus no efficiency calculations***
    - ***Plant loading curves versus no plant loading information***

Developing Specifications

- ***Define the needs and wants of the Economic Optimizer***
- ***Determine if your process information (PI) system has the required information***
  - ***If fuel composition is an economic driver the PI system will need composition inputs***
  - ***If external prices (ERCOT) is the economic driver the PI system will need external price inputs***

Developing Specifications

- ***Technology selection***
  - **Determine if technology package meets the needs and wants for the Economic Optimizer**
    - **Limitations due to using company standard technology**
      - ***Computer systems***
      - ***Software packages***
    - **Internal or external support**
    - **Is the purchased technology more than what is needed**
      - ***Too much complexity will cause higher maintenance costs***
    - **Easy to use and maintain**
    - **Reliability**
    - **Runtime**

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Implementation

- ***Costs associated with Economic Optimizers***
  - ***Design and installation***
    - ***Programming***
    - ***Data handling***
    - ***Computers***
    - ***Increased inputs***
    - ***Training and documentation***

Implementation

- ***Costs associated with Economic Optimizers***
  - ***Maintenance***
    - ***Updating the constraints***
    - ***Updating the models***
    - ***Quality of the input (data validation is critical)***
    - ***Better maintenance of instruments that are not normally critical for control***
    - ***Quality of the output (repeatable results)***
    - ***Software obsolescence***

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Implementation

- ***Costs associated with Economic Optimizers***
  - ***Value Creation***
    - ***Track savings and opportunity gap***
    - ***Monitor key performance indicators***
    - ***Report generation***
    - ***Refresher training***
- ***Economic Optimizers will require at least one part-time employee for normal maintenance and value creation***

Implementation

- ***Ease of use***
  - **Key stakeholders need easy to read displays**
  - **Operations needs to easily detect problems with models**

Implementation

- ***Tracking savings***
  - **It is critical to the success of any economic optimizer**
    - **Tracking savings**
  - **Typical tracking methods**
    - **Current operating cost versus baseline (adjusted for fuel price variations)**
    - **Difference between current and optimal operation (opportunity gap)**
    - **Optimizer run time or online time**

Key Learnings

- ***It is critical to understand the opportunity***
  - **Scope of job**
  - **Objectives of optimizer**
  - **Boundaries of control**

Key Learnings

- ***People resources need to be dedicated to increasing stakeholder involvement***
  - **Instrument technicians**
    - **Instruments that may not have been critical are now important for operations**
    - **Reports of bad instruments**
  - **Operations**
    - **Need to monitor and troubleshoot problems**
    - **Training**
    - **Developing tools that increase ease of use**
  - **Need a dedicated champion to sustain savings**

Key Learnings

- *Savings need to be publicized for all stakeholders*
- *Open-loop optimizers need to have more detailed models for successful operation*
  - *Constraint driven*
- *More complex does not mean more reliable*

Future Direction

- ***Dow is committed to continued use and integration of Economic Optimizers***
  - ***Dow currently has 4 closed-loop and multiple open-loop Economic Optimizers in the Energy Business***
  - ***Committed to a new optimizer at a Gulf Coast site***
  - ***Evaluating potential of adding Economic Optimizers at other large energy intensive sites globally***
  - ***Increased integration in operating discipline and control systems (closed-loop operation)***
  - ***Increased integration with suppliers and customers***
  - ***Part of the Energy Conservation Effort***

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